CLAIMS

What is claimed is:

1. A device for displaying an image having first and second image portions in response to an image signal, comprising:

a first light source responsive to a first input signal to emit a first modulated light beam along a first light path relative to the first light source;

a scanner having an input positioned along the first light path, the scanner being operative to receive the first modulated light beam and to redirect the first modulated light beam through a selected scan path toward a first image region in which the first modulated light beam defines a first image portion; and

electronic control circuitry having an input port for receiving the image signal and a first output coupled to the first light source, the control circuitry being responsive to the image signal to produce the first input signals, the control circuit further including:

an error circuit responsive to a determined error in the first modulated beam intensity to produce an error signal;

a correction circuit having an input coupled to the error circuit, the correction circuit being responsive to the error signal to adjust the first input signal to reduce the determined error.

2. The device of claim 1 wherein the error circuit includes a buffer containing correction data, and wherein the correction circuit includes an electronic multiplier.

3. The device of claim 1 wherein the first light source includes:

a light emitter; and

a modulator external to the light emitter.

4. The device of claim 1 wherein the first light source includes a directly modulatable light emitter.

5. The device of claim 1 wherein the first light source includes:
a light emitter; and
an optical fiber, optically coupled to the light emitter.

6. The device of claim 1 wherein the electronic control circuitry includes a clock circuit responsive to the image signal to produce a nonuniform clock signal having a nonuniformity corresponding to an expected nonlinearity of the scanning mirror scan pattern.

7. The device of claim 1 wherein the scanner is torsionally mounted to a base.

8. The device of claim 1 further including an electronically controllable mass carried by the scanning mirror, the electronically controlled mass being responsive to an electrical signal to move relative to the mirror.

9. The device of claim 8 wherein the scanner has a resonant oscillatory frequency, further including a sensor operative to produce an sensor signal indicative of mirror movement, and wherein the electronic control circuitry is coupled to receive the sensor signal and to vary the electrical signal in response thereto.

10. The device of claim 1 further including a second light source responsive to a second input signal to emit a second modulated light beam along a second light

path relative to the second light source, the second light source being oriented such that scanner is in the second light path and wherein the scanner is operative to redirect the second modulated light beam toward a second image region in which the second modulated light beam defines a second image portion, and wherein the orientation of the first and second light sources is selected such that the first and second regions are substantially non-overlapping.

11. The device of claim 10 further including a single light emitter that provides light for both of the first and second light sources.

12. The device of claim 10 wherein each of the first and second light sources includes a separate light emitter.

13. The device of claim 12 wherein each of the first and second light sources includes a plurality of light emitters, each at a separate wavelength.

14. The device of claim 12 wherein each of the light emitters includes an LED.

15. The device of claim 12 wherein each of the light emitters includes a laser diode.

16. The device of claim 12 wherein each of the light emitters includes a microlaser.

17. An image display for producing an image in an image field in response to an image signal, comprising:

an input terminal that receives the image signal;

an input circuit coupled to the input terminal, the input circuit being responsive to the image signal to produce a drive signal corresponding to the image signal;

a correction circuit having a signal input coupled to the input circuit, an error signal input, and a correction circuit output, the correction circuit being responsive to the drive signal at the signal input and an error signal at the error signal input to produce a corrected drive signal;

a scanning light source having an input port coupled to the correction circuit output, the scanning light source being responsive to the corrected drive signal to produce a first modulated light beam and to scan the first modulated light beam through a first scanning pattern, the scanning light source having a nominal output response that deviates from a desired output response; and

an error signal source having an error signal output coupled to the error signal input, the error signal source being operative to produce the error signal as a function of the deviation of the nominal output response from the desired output response.

18. The image display of claim 17 further comprising a light sensor positioned to detect a portion of the first beam of light, the sensor being operative to produce a sense signal indicative of the nominal output response, the light sensor further being coupled to the error signal source to provide the sense signal tot he srror signal source.

19. The image display of claim 17 wherein the predetermined scan pattern is biaxial.

20. The image display of claim 17 wherein the first light source includes a plurality of light emitters, each light emitter providing light in a respective wavelength range.

21. The image display of claim 18 wherein the first light source includes red, green, and blue light emitters.

22. A device for providing a selected image at a viewing location in response to an image signal, comprising:

a light source responsive to an input signal to emit an optical beam modulated according to the respective input signal, the light source having a variable intensity versus input signal response;

a scanning assembly positioned to receive the modulated optical beam and operative sweep the modulated beam through a corresponding region of the viewing location to produce the image; and

a correction circuit having an input terminal for receiving the image signal and an output port coupled to the light source, the correction circuit being responsive to the image signal and to variations in the intensity versus input signal response to produce the input signal that is not a constant function of the image signal.

23. The device of claim 22 wherein the intensity versus input signal response varies as a function of the selected image, wherein the correction circuit includes a memory device containing data sets representing such variations, and wherein the correction circuit is responsive to the image signal to retrieve corresponding respective data sets.

24. The device of claim 23 wherein the light source has a pattern dependent intensity response and wherein the memory device contains data corresponding to the pattern dependent response.

25. The device of claim 22 wherein the electronic controller includes:

a signal decoding circuit responsive to the image signal to produce image data corresponding to the image;

a memory buffer coupled to the decoding circuit and configured to store the image data;

a memory device containing correction data; and

a data combining circuit coupled to the memory buffer and the memry device, the data combining circuit being operative to retrieve image data from the memory buffer and correction data from the memory device and to produce corrected data representing the input signal that is not a constant function of the image signal.

26. The device of claim 22 wherein the scanning assembly includes a biaxial scanner.

27. The device of claim 26 wherein the biaxial scanner includes a single mirror that pivots about two substantially orthogonal axes.

28. A method of producing an image for viewing with a scanning display having a light emitter in response to an image signal representing a desired image, the light emitter having a response that varies as a function of patterns in the image, comprising the steps of:

identifying a nominal driving signal corresponding to the desired image;

responsive to the image signal, predicting a variation in the light emitter response;

producing an electrical signal indicative of the predicted variation;

responsive to the identified nominal driving signal and the electrical signal indicative of the predicted variation, producing a corrected driving signal;

responsive to the corrected driving signal, producing a light beam that is modulated according to the corrected driving signal; and

scanning the light beam through a selected scan pattern to produce the image.

29. The method of claim 28 wherein scanning the light beam through a selected scan pattern includes resonantly the light beam about a first axis at a first frequency.

30. The method of claim 28 wherein predicting a variation in the light emitter response includes predicting pattern dependent heating variations in the light emitter response.

31. The method of claim 28 wherein the display includes a memory device containing correction data and wherein producing an electrical signal indicative of the predicted variation includes retrieving the correction data from a buffer.

32. A display apparatus for viewing an image in response to an image signal, comprising:

a scanning system having a light input and a light output;

a modulated light source, including:

a light emitter having an electrical signal input and being responsive to an input signal at the signal input to produce modulated light having an intensity corresponding to the input signal; and

an electronic controller having an image input for receiving the image signal and a signal output coupled to the signal input of the light emitter, the electronic controller including a memory buffer for storing data corresponding to the image signal, a weighting circuit coupled to the memory buffer and operative to determine a correction factor in response to the stored data, and a multiplier circuit coupled to the memory buffer, the weighting circuit, and the signal output, the multiplier circuit being responsive to the stored data and the correction factor to produce the input signal at the signal output.

33. The display apparatus of claim 32 wherein the light emitter is an LED.

34. The display apparatus of claim 33 wherein the input signal is a drive current.

35. The display apparatus of claim 32 further comprising:

a photo detector optically coupled to the light emitter, the photo detector further including a detector output coupled to the weighting circuit.

36. The display apparatus of claim 35 wherein the weighting circuit is responsive to the photo detector to adjust the correction factor.

37. The display apparatus of claim 35 further comprising a synchronization circuit coupled to the photo detector and having a synchronization input for receiving a component of the image signal, the synchronization circuit being responsive to the component of the image signal and to the photo detector to produce a signal for updating the weighting circuit.

38. An apparatus for compensating for variations in an L-I response of a light emitter in a scanning display, comprising:

an intensity monitor optically coupled to the light emitter;

a reference signal source that provides a reference signal indicative of a desired intensity;

a comparing circuit coupled to the intensity monitor in the reference signal source and operative to produce an error signal indicative of the difference between a monitored intensity and the desired intensity; and

a correction circuit having a first input coupled to the comparing circuit, a second input configured to receive a driving signal for the light emitter, and a correction circuit output coupled to the light emitter, the correction circuit being responsive to the error signal and the driving signal to produce a corrected driving signal at the correction circuit output.

39. The apparatus of claim 38 further comprising an image signal decoder having an image input for receiving an image signal and a buffer coupled to the image input and configured to store data representing the image signal wherein the correction circuit is coupled to the buffer and wherein the driving signal includes data retrieved from the buffer.

40. The apparatus of claim 39 wherein the correction circuit includes:

a D/A converter that converts the retrieved data to an analog signal; and

a multiplier having a multiplication coefficient responsive to the error signal.

41. A method of stabilizing light intensity in a display, comprising steps of:

producing a drive current in response to an input signal;

determining a desired intensity of light in response to the input signal;

monitoring an actual intensity of light produced in response to the drive current;

determining a deviation between the monitored actual intensity of the light and the desired intensity of light; and

scaling the drive current in response to the determined deviation.

42. The method of claim 41 wherein the input signal includes data representing the desired intensity and wherein the step of scaling the drive current in response to the determined deviation includes digitally multiplying the data by a correction factor.

43. The method of claim 41 wherein the input signal includes data representing the desired intensity further including converting the data to an analog signal with a D/A converter and wherein the step of scaling the drive current in response to the determined deviation includes providing a control signal to the D/A converter.

44. The method of claim 41 wherein the display is a raster scanned display having a retrace interval and wherein the step of monitoring the actual intensity occurs during the retrace interval.

45. The method of claim 44 wherein further including providing a reference level signal during the retrace interval.

46. The method of claim 41 further including:

monitoring the input signal to determine an activation pattern; and

scaling the drive signal in response to the determined activation pattern.

47. The method of claim 46 wherein the input signal includes data representing a desired image, wherein monitoring the input signal to determine an activation pattern includes:

storing the data in a buffer;

retrieving a portion of the stored data; and

digitally processing the retrieved data.

48. A method of compensating for pattern dependent heating in a scanning beam display, comprising:

receiving an input signal representing a desired image for display;

storing in a memory device a digital representation of a portion of the input signal;

retrieving a first set of data from the memory device;

predicting a thermal effect in response to the retrieved first set of data;

retrieving a second set of data from the memory device, the retrieved data representing a selected image portion;

determining a drive signal in response to the second set of data; and

adjusting the drive signal in response to the predicted thermal effect.

49. The method of claim 48 further including:

producing an actual drive signal in response to the determined drive signal; and

wherein the step of adjusting the drive signal includes multiplying the actual drive signal by a scaling multiplier.

50. The method of claim 48 wherein the step of determining a drive signal includes producing a digital representation of a desired intensity and wherein the step of adjusting the drive signal in response to the predicted thermal effect includes digitally processing the digital representation to produce a compensated digital representation.

51. The method of claim 48 wherein the second set of data represents a target pixel for display and wherein the step of retrieving a first set of data from the memory device includes retrieving data representing one or more pixels preceding the target pixel.

52. The method of claim 48 wherein the display includes a light emitter having a thermal response, and wherein the step of predicting a thermal effect in response to the retrieved first set of data includes retrieving a set of characterization data representing light emitter thermal response.